UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/807,959	06/14/2001	Stephen K. Barton	206094US2PCT	6671

22850 7590 05/05/2005

OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
SHEW, JOHN	

ART UNIT	PAPER NUMBER
2664	

DATE MAILED: 05/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/807,959	BARTON ET AL.	
	Examiner	Art Unit	
	John L Shew	2664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 June 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *13 and 14* is/are allowed.

6)☒ Claim(s) *1-6,8 and 9,11-12,15-23* is/are rejected.

7)☒ Claim(s) *7 and 10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *6/14/2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *07172001,03182002*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the rectangular boxes of figures 1, 3, 5 and 6 must be shown with a labeled representation or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

Claim Objections

2. Claim 17 is objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend on another multiple depend claim such as the case generated by the limitation "a method as claimed in any preceding claim". See MPEP § 608.01(n).

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 3, 4, 5, 6, 8, 9, 11, 22, 12, 16, 15, 17, 18, 23, 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Nakamura (European Patent Application EP0854620A2).

Claim 1, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-20) referenced by a synchronization signal generating means, representing a symbol boundary in an OFDM signal (Title, Abstract lines 1-25) referenced by the OFDM demodulation apparatus correlation between the data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval and Guard Interval, with data in each guard space corresponding to part of the data in a respective useful period (FIG. 1, column 2 lines 13-23) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side, the method comprising providing a signal representing the degree of correlation between samples of a received signal which are separated by a period corresponding to the useful part of the symbol (FIG. 2A, FIG. 2B, FIG. 2C, column 2 lines 24-42) referenced by the Correlation Signal generated by the Original Signal to the Delayed Signal wherein the Guard Interval is correlated to the end of the Effective Symbol, the signal thus providing an output representing for each symbol an interval during which significant correlation is found (FIG. 2D, column 2 lines 43-51) referenced by the integration of the correlation signal to find significant correlation during the interval, the method comprising the further step of determining a sub-interval within which a maximum degree of correlation occurs (column 5 lines 49-52, FIG. 6C, column 9 lines 15-23) referenced by the subinterval Tc/2 or defined by half of the Guard Interval Tc wherein the peak correlation occurs, and arranging for the

synchronization pulse to be provided within this sub-interval (FIG. 6E, FIG. 6F, column 9 lines 15-39) referenced by the output Correlation Signal and Signal of Integration during the subinterval.

Claim 2, Nakamura teaches the sub-interval is determined by applying a threshold to the signal representing the degree of correlation (FIG. 6F, column 9 lines 40-56) referenced by the TH threshold of the interval integration slightly lower than the amplitude of the triangular integrated signal.

Claim 3, Nakamura teaches the threshold is varied (column 9 lines 40-58, column 10 lines 1-5) referenced by the determination of the threshold for removing noise with noise being variable thereby the determination of the threshold is variable.

Claim 4, Nakamura teaches the threshold represents a value which is dependent upon the maximum value of the signal representing the degree of correlation (FIG. 6E, FIG. 6F, column 9 line 40-56) referenced by the threshold TH being slightly lower than the amplitude of the triangular wave signal which represents the maximum degree of correlation.

Claim 5, Nakamura teaches the signal representing the degree of correlation is subject to filtering prior to using the signal to determine said sub-interval (FIG. 5) referenced by the filtering action of Correlators 47 46 prior to the Integration by Parts unit 48 which

outputs a signal representing the degree of correlation, the filtering being such that each filtered output sample represents substantially an average of a predetermined number of successive samples (FIG. 5, column 10 lines 15-26) referenced by Averaging Circuit 49 of the time synchronization signals wherein the number used for averaging is predetermined to be 76, said predetermined number being substantially less than the number of samples within a guard space (column 10 lines 15-26) referenced by the reduced number of samples at 15.

Claim 6, Nakamura teaches the filtered output represents values averaged over a plurality of symbols (column 10 lines 15-26) referenced by the averaging circuit output averages the time synchronization signals of the respective predetermined number of symbols.

Claim 8, Nakamura teaches the filtered output is subjected to further filtering before being processed to provide a signal representing a fine frequency offset (FIG. 5, column 10 lines 27-43) referenced by the further filtering action of the Phase Discriminating/Frequency Sinc unit 51 to provide an AFC frequency signal adjustment to the RF Amplifier/Frequency Converter unit 32.

Claim 9, Nakamura teaches the step of adjusting the timing of the synchronization pulse only if a calculated error in the current timing exceeds a predetermined threshold (FIG. 5, FIG. 6F, column 9 lines 52-58, column 10 lines 1-5) referenced by the use of

threshold TH to determine the output of Integration by Parts/Peak Discriminator Circuit 48 wherein if the TH is not reached to correct for noise error then no Time Sync Signal is generated.

Claim 11, Nakamura teaches wherein the timing of the synchronisation pulse is adjusted in predetermined quantities corresponding to a plurality of sample periods (column 10 lines 6-26) referenced by the averaging circuit to average the timing synchronization signals based on a predetermined number of symbols wherein the number of symbols can be 76, 55, 35, 15 each being a different sample period.

Claim 22, Nakamura teaches an apparatus for generating a synchronizing pulse (FIG. 5) referenced by the reception (demodulating) apparatus with the Time Sync Signal Generating Circuit 48.

Claim 12, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-20) referenced by a synchronization signal generating means, representing a symbol boundary in an OFDM signal (Title, Abstract lines 1-25) referenced by the OFDM demodulation apparatus correlation between the data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval and Guard Interval, with data in each guard space corresponding to part of the data in a respective useful period (FIG. 1,

column 2 lines 13-23) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side, the method including the step of adjusting the timing of the synchronization pulse in response to a calculated error in the current timing exceeds a predetermined threshold (FIG. 5, FIG. 6F, column 9 lines 52-58, column 10 lines 1-5) referenced by the use of threshold TH to determine the output of Integration by Parts/Peak Discriminator Circuit 48 wherein if the TH is not reached to correct for noise error then no Time Sync Signal is generated.

Claim 16, Nakamura teaches wherein the timing of the synchronisation pulse is adjusted in predetermined quantities corresponding to a plurality of sample periods (column 10 lines 6-26) referenced by the averaging circuit to average the timing synchronization signals based on a predetermined number of symbols wherein the number of symbols can be 76, 55, 35, 15 each being a different sample period.

Claim 15, Nakamura teaches a method of generating a synchronization pulse (Abstract lines1-20) referenced by a synchronization signal generating means, representing a symbol boundary in an OFDM signal (Title, Abstract lines 1-25) referenced by the OFDM demodulation apparatus correlation between the data period and guard period at a position away from the modulated signal by one modulation time representing the symbol boundary, comprising useful symbol periods separated by guard spaces (FIG. 1) referenced by the Effective Symbol Interval and Guard Interval, with data in each

guard space corresponding to part of the data in a respective useful period (FIG. 1, column 2 lines 13-23) referenced by the symbol end side including a period having correlation to the guard interval head side i.e. a period having the same signal portion and the same interval on the end side, the method including the step of adjusting the timing of the synchronization pulse in predetermined quantities corresponding to a plurality of sample periods (column 10 lines 6-26) referenced by the averaging circuit to average the timing synchronization signals based on a predetermined number of symbols wherein the number of symbols can be 76, 55, 35, 15 each being a different sample period.

Claim 17, Nakamura teaches a method of receiving an OFDM signal (Title, Abstract lines 1-20, FIG. 5) referenced by the OFDM demodulating receiver apparatus, the method including the step of generating a synchronization pulse (Abstract lines1-20) referenced by a synchronization signal generating means, and using the synchronization pulse in order to apply a Fast Fourier Transform to complex samples derived from the OFDM signal (FIG. 5, column 10 lines 15-26) referenced by the synchronization pulse from the Averaging Circuit 49 to the FFT Circuit 35 to adjust the timing of the OFDM signal at Antenna 31.

Claim 18, Nakamura teaches further including the step of providing when the timing of the synchronization pulse is altered a signal representing the degree of alteration (FIG. 5, FIG. 6E, column 9 lines 40-52) referenced by the Rough Sync. Signal and the

alteration of the signal by the Time Sync Signal Generating Circuit 48, and applying to the transformed samples phase rotations determined by this signal (FIG. 5, column 10 lines 27-34) referenced by the Phase Discriminating Signal Generating Circuit 51 which adjusts a phase/frequency correction to the OFDM signals for processing by the FFT Circuit 35.

Claim 23, Nakamura teaches an OFDM apparatus for receiving an OFDM signal (Title, Abstract lines 1-20, FIG. 5) referenced by the OFDM demodulating receiver apparatus.

Claim 20, Nakamura teaches a method of receiving an OFDM signal (Title, Abstract lines 1-20, FIG. 5) referenced by the OFDM demodulating receiver apparatus, the method including the steps of generating a synchronization pulse (Abstract lines1-20) referenced by a synchronization signal generating means, and using the synchronization pulse in order to apply a Fast Fourier Transform to complex samples derived from the OFDM signal (FIG. 5, column 10 lines 15-26) referenced by the synchronization pulse from the Averaging Circuit 49 to the FFT Circuit 35 to adjust the timing of the OFDM signal at Antenna 31, the method further including the step of providing when the timing of the synchronization pulse is altered a signal representing the degree of alteration (FIG. 5, FIG. 6E, column 9 lines 40-52) referenced by the Rough Sync. Signal and the alteration of the signal by the Time Sync Signal Generating Circuit 48, and applying to the transformed samples phase rotations determined by this signal (FIG. 5, column 10 lines 27-34) referenced by the Phase Discriminating Signal

Generating Circuit 51 which adjusts a phase/frequency correction to the OFDM signals for processing by the FFT Circuit 35.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 19, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura as applied to claims 1, 2, 3, 4, 5, 6, 8, 9, 11, 22, 12, 16, 15, 17, 18, 23, 20 above, in view of Park et al. (Patent number 6470030).

Claims 19, 21, Nakamura teaches a demodulating apparatus for OFDM signals including phase discrimination. He does not teach phase rotations are determined by values in a lookup table.

Park teaches the phase rotations are determined by values in a look-up table addressed in accordance with the signal representing the degree of alteration of the synchronization pulse timing (FIG. 1, column 3 lines 64-67, column 4 lines 1-8, column 5 lines 10-14) referenced by the phase memory 560 of a lookup table for phase error estimation for synchronization.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the phase memory of Park to the OFDM demodulating apparatus of Nakamura for the purpose of providing an OFDM receiver with an optimal structure of resource utilization efficiency and chip area (Park - column 2 lines 8-16).

Allowable Subject Matter

5. Claims 13-14 are allowed.

Claims 7, 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

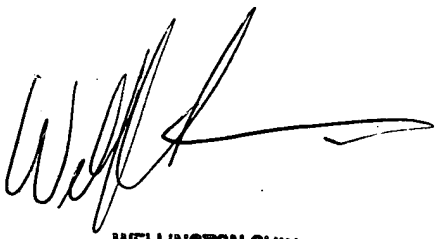
Citation of Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Patent number 6563896, Nomura et al. discloses a digital broadcast receiver and receiving method. Patent number 6456649, Isaksson et al. discloses multi-carrier transmission systems.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John L Shew whose telephone number is 571-272-3137. The examiner can normally be reached on 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wellington Chin can be reached on 571-272-3134. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



WELLINGTON CHIN
SUPERVISORY PATENT EXAMINER

js